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09/943,966	08/31/2001	Michael M. Thackeray	220	1578

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EXAMINER

RADEMAKER, CLAIRE L

ART UNIT	PAPER NUMBER
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1753

MAIL DATE	DELIVERY MODE
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09/25/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/943,966

Applicant(s)

THACKERAY ET AL.

Examiner

Claire L. Rademaker

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 1/24/2002; 8/31/2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 1/24/2002
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character not mentioned in the description: "η" (Figures 1A-1C and 2A-2C). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 7, 8, and 9 are objected to because of the following informalities:
- i. With regard to claim 8, the term "metal element components" should read "metal salt" (claim 1) or "metal chloride" (claim 3) in order to remain consistent with the terminology used in claims 1 and 3.
 - ii. With regard to claims 7 and 9, the terms "reducing metal" (claim 7) and "reducing metal powder" (claim 9) should read "metal reducing agent"

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(claim 1) in order to remain consistent with the terminology used in claim

1.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 8, 10, and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

i. In claim 8, the term "electrode matrix" lacks antecedent basis. It is unclear what the electrode matrix is.

ii. In claim 10, it is unclear when the annealing step occurs. Also, the term "the solid intermetallic product" lacks antecedent basis.

iii. In claim 11, it is unclear when the additive (a grain growth inhibitor, a porosity regulator, polymeric binders, or electronically conducting additives) is added in the process.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-8 and 11-12 are rejected under 35 U.S.C. 102(a) as being anticipated by Shi et al. ("Nano-SnSb alloy deposited on MCMB as an anode material for lithium ion batteries", *J. Mater. Chem.*, 2nd April 2001, 11, 1502-1505).

With regard to claims 1-7, Shi et al. discloses a method for synthesizing an intermetallic negative electrode (page 1502, col. 1) for an electrochemical cell (page 1502, col. 1-2) comprising: dissolving two metal chlorides $\text{SnCl}_2 \cdot \text{H}_2\text{O}$ and SbCl_3 (page 1502, col. 2) in an organic solvent glycerol, also commonly known as glycerin (page 1502, col. 2) forming a solution (page 1502, col. 2); adding a metal reducing agent Zn (page 1502, col. 2) to the solution to form an intermetallic compound; precipitating the intermetallic compound (page 1502, col. 2); separating the precipitate from the solution (page 1502, col. 2) and forming the precipitate into an electrode (page 1502 col. 2 – page 1503, col. 1).

With regard to claim 8, Shi et al. discloses that an excess of one or more metal element components reacting to form the intermetallic compound (page 1502, col. 2).

With regard to claim 11, Shi et al. discloses the addition of an electronically conducting additive MCMB (page 1502, col. 2).

With regard to claim 12, Shi et al. teaches an electrochemical cell (page 1502, col. 2), containing the negative intermetallic electrode as described above, a non-aqueous electrolyte ethylene carbonate-diethylene carbonate (EC-DEC) and a positive electrode (page 1502, col. 2 - page 1503, col. 1).

5. Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000).

With regard to claims 1-8, Li et al. (2000) teaches a method for synthesizing an intermetallic negative electrode (page 693, col. 2) for an electrochemical cell (page 693, col. 2) comprising: dissolving two metal chlorides $\text{SnCl}_2 \cdot \text{H}_2\text{O}$ and SbCl_3 (page 693, col. 2) in an organic solvent ethane-1,2-diol (page 693, col. 2) forming a solution (page 693, col. 2), wherein one or more of the metal element components is contained within the electrode matrix (page 693, col. 2); adding a metal reducing agent Zn (page 693, col. 2) to the solution to form an intermetallic compound; precipitating the intermetallic compound (page 693, col. 2); separating the precipitate from the solution (page 693, col. 2) and forming the precipitate into an electrode (page 693, col. 2).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000).

The disclosure of Li et al. (2000) as discussed above is fully incorporated herein.

With regard to claim 9, Li et al. (2000) teaches that stoichiometric amounts of metal chlorides $\text{SnCl}_2 \cdot \text{H}_2\text{O}$ and SbCl_3 (page 693, col. 2) are dissolved in an organic solvent ethane-1,2-diol (page 693, col. 2), stirred at approximately 0°C during the addition of metal reducing agent Zn (page 693, col. 2) and then can be stirred for 8 hours (page 693, col. 2) at room temperature (page 693, col. 2), but fails to specifically teach the duration of the first stirring period.

While Li et al. (2000) does not specifically teach the duration of the first stirring period, it is well known in the art to adjust the duration of stirring in order to control morphology and particle size (page 696, col. 2). Stirring is recognized as a result-

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effective variable. Therefore, it would have been obvious to one of ordinary skill in the art to stir at the claimed period of time in the first stirring step because it has been held that optimization of result-effective variables is routine experimentation. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With regard to claim 10, Li et al. (2000) teaches the concept of drying the solid intermetallic product in an inert atmosphere at 50°C (page 693, col. 2), but fails to teach drying the product at 150-400°C (which inherently anneals the product).

While Li et al. (2000) fails to disclose the specified drying temperature, it would have been obvious to one of ordinary skill in the art at the time of the invention to raise the drying temperature of Li et al. (2000) to above 197°C in order to remove traces of ethane-1,2-diol used in the reaction because the boiling point of ethane-1,2-diol is 197°C, as evidenced by The Chemical Thesaurus (http://www.chemthes.com/entity_datapage.php?id=619), and the higher the temperature of drying would dry the material much faster. At this higher temperature of drying, the product is inherently annealed. Furthermore, the applicant has not shown any criticality of annealing at 150-400°C.

8. Claim 9 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Shi et al. ("Nano-SnSb alloy deposited on MCMB as an anode material for lithium ion batteries," *J. Mater. Chem.*, 2nd April 2001, 11, 1502-1505) in view of Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy

prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000).

The disclosure of Shi et al. as discussed above is fully incorporated herein.

With regard to claim 9, Shi et al. teaches that stoichiometric amounts of metal chlorides $\text{SnCl}_2 \cdot \text{H}_2\text{O}$ and SbCl_3 (page 1502, col. 2) are dissolved in an organic solvent glycerol, also commonly known as glycerin (page 1502, col. 2), stirred at approximately 0°C during the addition of metal reducing agent Zn (page 1502, col. 2, and then stirred further, but fails to teach the duration of each stirring period and the temperature at which the second stirring occurs.

Li et al. (2000) teaches that the second stirring period can occur for 8 hours (page 693, col. 2) and can occur at room temperature (page 693, col. 2), but fails to specifically teach the duration of the first stirring period.

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the concept of adjusting the duration of stirring at room temperature of Li et al. (2000) to the concept of stirring the intermetallic mixture containing Zn of Shi et al. in order to control morphology and particle size (page 693, col. 1 & page 696, col. 2).

While Li et al. (2000) does not specifically teach the duration of the first stirring period, it is well known in the art to adjust the duration of stirring in order to control morphology and particle size (page 696, col. 2). Stirring is recognized as a result-effective variable. Therefore, it would have been obvious to one of ordinary skill in the

art to stir at the claimed period of time in the first stirring step because it has been held that optimization of result-effective variables is routine experimentation. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shi et al. ("Nano-SnSb alloy deposited on MCMB as an anode material for lithium ion batteries," *J. Mater. Chem.*, 2nd April 2001, 11, 1502-1505) in view of Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000).

The disclosure of Shi et al. and Li et al. (2000) as discussed above is fully incorporated herein.

With regard to claim 10, Shi et al. teaches the concept of drying the solid intermetallic product in a vacuum (which is an inert environment) at 55°C (page 1502, col. 2), but fails to teach drying the product at 150-400°C (which inherently anneals the product).

While Shi et al. fails to teach the specified drying temperature, it would have been obvious to one of ordinary skill in the art at the time of the invention to raise the drying temperature of Shi et al. to above 290°C in order to remove traces of glycerol used in the reaction because the boiling point of glycerol is 290°C, as evidenced by

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Mallinckrodt Chemicals (<http://www.jtbaker.com/msds/englishhtml/g4774.htm>), and the higher temperature of drying would dry the material much faster. At this higher temperature of drying, the product is inherently annealed. Furthermore, the applicant has not shown any criticality of annealing at 150-400°C.

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shi et al. ("Nano-SnSb alloy deposited on MCMB as an anode material for lithium ion batteries," *J. Mater. Chem.*, 2nd April 2001, 11, 1502-1505) in view of Vaughey et al. (US 6,855,460).

The disclosure of Shi et al. as discussed above is fully incorporated herein.

With regard to claim 13, Shi et al. fails to teach a plurality of cells arranged in series and/or in parallel.

Vaughey et al. teaches that batteries containing intermetallic negative electrodes can be connected in parallel and/or series and/or parallel (col. 2, lines 27-29 & col. 9, lines 48-50 & 59-62; Figure 10).

It would have been obvious to one of ordinary skill in the art at the time of the invention to add the concept of arranging a plurality of cells in series and/or parallel of Vaughey et al. to the electrochemical cell of Shi et al. in order to obtain the desired voltage output for a particular application.

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11. Claims 1 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inagaki et al. (US 6,541,157) in view of Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000).

With regard to claims 1 and 11-12, Inagaki et al. discloses an electrochemical cell (col. 1, lines 8-10), containing a negative intermetallic electrode (col. 6, lines 42-45 & col. 4, lines 8-11 & 16-25), a non-aqueous electrolyte ethylene carbonate (EC) or propylene carbonate (PC) (col. 7, lines 50-53) and a positive electrode (col. 1, lines 65-66), but fails to claim the specified method by which the negative electrode was synthesized.

Li et al. (2000) teaches a method for synthesizing an intermetallic negative electrode (page 693, col. 2) for an electrochemical cell (page 693, col. 2) comprising: dissolving two metal chlorides $\text{SnCl}_2 \cdot \text{H}_2\text{O}$ and SbCl_3 (page 693, col. 2) in an organic solvent ethane-1,2-diol (page 693, col. 2) forming a solution (page 693, col. 2), wherein one or more of the metal element components is contained within the electrode matrix (page 693, col. 2); adding a metal reducing agent Zn (page 693, col. 2) to the solution to form an intermetallic compound; precipitating the intermetallic compound (page 693, col. 2); separating the precipitate from the solution (page 693, col. 2) and forming the precipitate into an electrode (page 693, col. 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the synthesis method of Inagaki et al. with the synthesis method of Li et al. (2000) in order to obtain an intermetallic anode with high purity (page 693, col. 1) and good electrochemical performance (abstract, Li et al. (2000)) due to low capacity loss of nanosized materials during cycling of the anode.

12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagaki et al. (US 6,541,157) and Li et al. ("Synthesis and electrochemical performances of dendrite-like nanosized SnSb alloy prepared by co-precipitation in alcohol solution at low temperature," *J. Mater. Chem.*, February 2000, 11, 10, 693-696) hereinafter Li et al. (2000). as applied to claim 12 above, and further in view of Vaughey et al. (US 6,855,460).

The disclosure of Inagaki et al. and Li et al. (2000) as discussed above is fully incorporated herein.

With regard to claim 13, Inagaki et al. modified by Li (2000) fails to teach a plurality of cells arranged in series and/or in parallel.

Vaughey et al. teaches that batteries containing intermetallic negative electrodes can be connected in parallel and/or series and/or parallel (col. 2, lines 27-29 & col. 9, lines 48-50 & 59-62; Figure 10).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to add the concept of arranging a plurality of cells in series and/or parallel of Vaughey et al. to the electrochemical cell of Inagaki et al. as modified by Li et al. (2000) in order to obtain the desired voltage output needed for particular electronic applications.

Conclusion

13. The prior art made of record and not relied upon which is considered pertinent to the applicant's disclosure is as follows: Huang et al. ("Studies on Capacity Loss and Capacity Fading of Nanosized SnSb Alloy Anode for Li-Ion Batteries," *Journal of the Electrochemical Society*, 5th July 2001, 148, 8, A915-A922) discloses a method of synthesizing an intermetallic SnSb anode for lithium batteries.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Claire L. Rademaker whose telephone number is 571-272-9809. The examiner can normally be reached on Monday - Friday, 8:00AM - 4:30PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CLR



SUSYTSANG-FOSTER
PRIMARY EXAMINER